

**REMARKS**

Claims 1-15 are pending while claims 1-15 stand rejected. Claims 1, 7, 8, and 9 have been amended while claims 16-18 are newly added. Claims 1-18 remain for consideration upon entering the present amendment. No new matter has been added. Support for the amendments may be found at least on pages 2 and 6-8 of the specification and Figures 2 and 3 as originally filed.

***Claim Rejections -35 USC §102***

Claims 1 and 6-10 stand rejected under 35 U.S.C. §102(e) as being anticipated by Yang et al. (U.S. Patent No. 6,322,919). Applicants respectfully traverse.

The Examiner alleges that Yang teaches a fuel cell stack comprising first plate 64 and second plate 14 (Fig. 4). The Examiner alleges that the plates juxtapose each other such that they are inherently in thermal communication with each other. The bipolar plate 12 is configured such that adjacent oxidant channels 18 and fuel channels 24 are offset from one another in a direction traverse to the fuel and oxidant paths defined thereby (col. 3, lines 30-35) and that each of said plates comprising fuel inlet and outlet manifolds 32 and 34, oxidant inlet and outlet manifolds 36 and 38, and coolant inlet and outlet manifolds 40 and 42 formed in the frame (col. 3, lines 65-68 and col. 4, lines 1-5).

More specifically, it is respectfully submitted that Yang discloses a fuel cell bipolar plate including a fuel side (22) having a series of fuel channels defining respective fuel paths and an oxidant side (16) having a series of oxidant channels defining respective oxidant paths. See Abstract and Figure 3. Yang teaches individual PEM fuel cells combined as a membrane electrode assembly (MEA) where individual MEAs are stacked in electrical series with impermeable electrically conductive bipolar plates therebetween that conduct current between the anode of one MEA and the cathode of the adjacent MEA. Conventional bipolar plates are flat plates that have one or more channels formed on one side for transporting fuel over one MEA and one or more channels formed on the other side for transporting oxidant over another MEA. Col. 1, lines 19-40. In particular, Yang teaches a bipolar plate that does not include a large solid area of plate material between adjacent channels because the fuel channels and oxidant channels are not aligned and, accordingly, channels are located in the area that is

occupied by plate material in conventional bipolar plates. Col. 2, lines 42-49.

Furthermore, Yang teaches with respect to Figure 4 a separator plate 62 and a bipolar plate assembly 10 (including a bipolar plate 12 and a frame 14) with a coolant plate 64 therebetween. Col. 5, lines 25-27. The coolant plate 64 is flat on one face and includes coolant channels 65 on the other face 68 that are in communication with the coolant manifolds 40 and 42. Suitable coolants include water, ethylene glycol, and polyalphaolefins. Col. 5, lines 44-49. Accordingly, the coolant plate 64 does not allow flow of both fuel and oxidant across either side defining plate 64 and only allows flow of coolant therethrough, thus teaching away from Applicants invention as coolant plate 64 cools bipolar plate 12. In other words, coolant plate 64 does not heat flow of both the anode and cathode supply, as claimed. Yang also teaches away in that the fuel and oxidant flow (i.e., anode and cathode supply) are on opposite sides defining bipolar plate 12. See Figure 3 of Yang and accompanying description.

More specifically, Yang does not teach or suggest, and in fact teaches away from, a first plate having first flow channels defined at one side thereof, said first flow channels of said first plate being orientated in a first direction, said first plate having a first supply opening and a first exhaust opening therein, said first supply and first exhaust openings of said first plate positioned for communicating with said first flow channels of said first plate, said first flow channels configured to allow flow of both anode supply and cathode supply across said first plate to a fuel cell; and a second plate having second flow channels defined at one side of said second plate, said second flow channels of said second plate being orientated in a second direction different from said first direction, said second plate having a second supply opening and a second exhaust opening positioned for communicating with said second flow channels of said second plate, said second flow channels configured to allow flow of both anode exhaust and cathode exhaust across said second plate from said fuel cell, said second plate being disposed in thermal communication with said first plate heating said flow of both said anode supply and said cathode supply via said flow of both anode exhaust and cathode exhaust having a higher temperature, as in amended claim 1. Thus claims 1, including claims depending therefrom, i.e., claims 2-10 and 16-18, define over Yang.

Similarly with respect to claim 11, Yang does not teach or suggest, and in fact

teaches away from, communicating an exhaust received at an exhaust opening in a first plate through exhaust flow channels defined at one side of said first plate to an exhaust opening out of said first plate, said exhaust flow channels being orientated in a first direction; communicating an oxidant received at an anode supply opening in a second plate through anode supply flow channels defined at one side of said second plate to an anode supply opening out of said second plate, said anode supply flow channels being orientated in a second direction, said second plate being disposed in thermal communication with said first plate; communicating a reformate received at a cathode supply opening in said second plate through cathode supply flow channels defined at one side of said second plate to an anode supply opening out of said second plate, said cathode supply flow channels being orientated in said second direction; and whereby said oxidant and said reformate are heated. Thus, claim 11, including claims depending therefrom, i.e., 12-15, define over Yang.

#### *Claim Rejections -35 USC §103*

Claims 2-5 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Yang et al. (U.S. Patent No. 6,322,919) as applied to claim 1 above, in view of Pratt et al. (U.S. Patent No. 6,132,895) and further in view of Spear, Jr. et al. (U.S. Patent No. 6,051,331). Applicants respectfully traverse.

The Examiner states that Yang is silent to etching the flow channels into the plate and to etching forms including S-shape patterns or serpentine patterns. However, the Examiner alleges that Pratt teaches that it is conventional to employ etching as a means of forming flow channels in bipolar plates. More specifically, the reference teaches that the preferred method of making the channels is by chemically etching them, using photolithography and that of course, other means of forming the channels, such as by machining, can also be used, but the most accurate and cost effective means is to chemically etch them.

The Examiner also alleges that Spear teaches that it is conventional to etch serpentine microchannels in bipolar plates in order to provide more uniform distribution of reactant gasses (abstract and col. 8, lines 4-6). The Examiner concludes that therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was

made to etch flow channels into the bipolar plate of Yang in order to create surfaces on the channels that are microscopically rough to aid in gas flow distribution and to etch serpentine microchannels into the plate of Yang, in order to provide more uniform distribution of reactant gases.

It is respectfully pointed out that claims 2-5 depend from claim 1 which is submitted as being allowable for defining over Yang as discussed above. Furthermore, it is respectfully noted that use of etching as a means of forming flow channels in bipolar plates as taught by Pratt and use of etching serpentine microchannels in bipolar plates as taught by Spear do not cure the deficiencies noted above with respect to Yang.

Accordingly, it is respectfully requested that the rejection to claims 2-5 be withdrawn.

Claims 11-15 are rejected under 35 U.S.C. §103(a) as being unpatentable over Yang et al. (U.S. Patent No. 6,322,919), in view of Pratt et al. (U.S. Patent No. 6,132,895) and further in view of Roberts et al. U.S. Pub. 2001/0055707. Applicants respectfully traverse.

The Examiner alleges that Roberts teaches heating the reformatte and the oxidant before charging into the fuel cell in order to prevent drying of the ion transfer membrane (par. 9). The Examiner concludes that therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to etch flow channels into the bipolar plate of Yang in order to create surfaces on the channels that are microscopically rough to aid in gas flow distribution and to heat the reformatte and oxidant in order to prevent drying of the ion transfer membrane.

It is respectfully pointed out that claims 12-15 depend from claim 11 which is submitted as being allowable for defining over Yang as discussed above. Furthermore, it is respectfully noted that use of etching as a means of forming flow channels in bipolar plates as taught by Pratt and heating the reformatte and the oxidant before charging into the fuel cell as taught by Roberts do not cure the deficiencies noted above with respect to Yang.

Accordingly, it is respectfully requested that the rejection to claims 11-15 be withdrawn.

***Conclusion***

Applicants believe that the foregoing amendments and remarks fully comply with the Office Action and that the claims herein are allowable to Applicants. In view of the foregoing points that distinguish Applicants' invention from those of the prior art and render Applicants' invention not obvious, Applicants respectfully request that the Examiner reconsider the present application, remove the rejections, and allow the application to issue.

If the Examiner believes that a telephone conference with Applicants' attorneys would be advantageous to the disposition of this case, the Examiner is invited to telephone the undersigned.

In the event any further fees are due with respect to this amendment or otherwise, please charge them to Deposit Account No. 06-1130, maintained Applicants' Attorneys.

Respectfully submitted,

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